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ATTORNEY-AT-LAW

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January 26, 1994

VIA HAND DELIVERY

Mr. William F. Caton  
Acting Secretary  
Federal Communications Commission  
1919 M Street, N.W.  
Room 222  
Washington, D.C. 20554

Re: Ex Parte Submission of MFS Communications, Inc. and Texas  
Instruments Corporation in PR Docket No. 93-61

Dear Mr. Caton:

On behalf of MFS Network Technologies, Inc. ("MFS") and Texas Instruments Corporation ("TI") (collectively "MFS/TI"), and pursuant to Sections 1.206 of the Commission's Rules, 47 C.F.R. § 1.206 (1992), we submit this ex parte filing to provide additional information describing the TIRIS® automatic vehicle identification system ("AVI") to be used by MFS and TI in numerous highway and transportation projects in California and in other states. Most recently, it was announced that the California Department of Transportation awarded the \$30 million contract to MFS to install a TIRIS®-based toll collection system on nine California bridges and implement an electronic toll collection system.

Specifically, MFS/TI submit at Attachment I a brief description of its TIRIS®-based reader/tag system including general specifications, a sketch of the toll structure and the outside case and PC board. At Attachment II, MFS/TI submits a recent trade press article describing the recent CALTRANS decision to implement the MFS/TI toll system on nine California bridges.

MFS/TI submit this information in support of its view that the Commission should adopt an allocation scheme for the 902-928 MHz band that would accommodate multiple innovative automatic vehicle monitoring ("AVM") and AVI technologies and providers. In particular, in its earlier filings in this proceeding, MFS/TI proposed that the Commission permit wide area

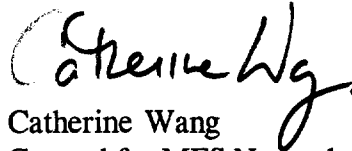
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pulse ranging systems to operate in a single 8 MHz band (902-910 MHz) and other AVI systems on a shared basis in the remaining contiguous 18 MHz band. As stated in earlier pleadings, the MFS/TI proposal strikes an equitable balance among the existing technologies competing to use scarce spectrum, encourages future innovation, and benefits consumers by fostering competition in providers and services.

Please direct any questions regarding the attached materials to the undersigned.

Very truly yours,

A handwritten signature in black ink, appearing to read "Catherine Wang". The signature is fluid and cursive, with a large initial "C" and a long, sweeping tail.

Catherine Wang  
Counsel for MFS Network Technologies, Inc.  
and Texas Instruments Corporation

Attachments

cc: Kevin Moersch  
Howard Sierer  
Steve Reynolds  
Mark DeSantis  
Andrew Lipman

## **Chapter 1. Introduction.**

### **1-1. Scope.**

The objective of this document is to provide a complete description of the TIRIS Automatic Vehicle Identification (AVI) System. Chapters 2 and 3 contain physical and functional descriptions of the major components of the TIRIS AVI system. Chapter 4 details installation requirements of the system, and Chapter 5 outlines system maintenance requirements.

### **1-2. General.**

The TIRIS AVI system is currently under development by Texas Instruments for the California Department of Transportation (CALTRAN). The system is designed to automate the collection of tolls for transportation agencies.

### **1-3. Features.**

The system consists of three primary components: the automobile transponder, the antenna assembly, and the reader computer. The automobile transponder, or tag, is a small, transmit and receive device mounted in the automobile, typically on the windshield near the driver's side of the vehicle. The antenna assembly is mounted directly over the lane of traffic to be monitored, with one antenna dedicated to each lane. The antenna assembly is connected by cable to the reader computer, which can be located some distance away.

The most significant features of the TIRIS AVI system are listed below:

- Communications with vehicles at speeds up to 160 kmph (100 mph) with a reliability of 99.99% or better.
- Ability to discriminate between tags in vehicle separated by 60 cm (2 feet) or more, thus providing lane separation.
- Multiple-tag capability; one car can have multiple tags and the system can communicate with each unique tag.
- Ability to identify motorcycles traveling side-by-side.
- Capacity to conduct more than 2200 transactions per hour, per lane.
- Compliance with California Code of Regulations, Title 21, Chapter 16, Articles 1 through 7.

#### 1-4. Specifications.

The following paragraphs provide technical specifications for the TIRIS AVI system.

##### 1-4.1. Vehicle Transponder Specifications.

Physical dimensions:	9.49 X 8.74 X 1.09 cm. (3.74 X 3.44 X 0.428 in.)
Weight:	16.44 gm. 0.58 oz.
Vehicle Mounting	Within 76.2 cm. (30 in.) of vehicle center line. Oriented within 30 degrees of preferred orientation.
Power Supply	Internal 3.0 Volt battery
Antenna Reflective Aperture Change	RCS change of 45 cm <sup>2</sup> minimum change and 100 cm <sup>2</sup> maximum change with applied modulation.
Modulation	Backscatter modulation by varying the reflective aperture between a reflective state, representing a "Mark" and a non-reflective state, representing a "Space". The data format will be FSK using a 600 KHz space and a 1200 KHz mark, with a baud rate of 300 kbps. All frequency tolerances shall be 10 %.
Activation Level	Transponder shall activate when subjected to a field greater than 500 mV/m $\pm$ 1.5 dB applied at 915 MHz containing Manchester encoded modulation of an alternating "1" and "0" pattern. Activation shall occur within 33 $\mu$ seconds.
Non-Activation Level	Transponder shall not be activated by an applied field of less than 500 mV/m -1.5 dB.
Reliability	TBD
Environmental Specifications	Storage Temperature: -25° to +85° C Operating Temperature: -25° to +70° C

## **1-4.2. Reader Specifications.**

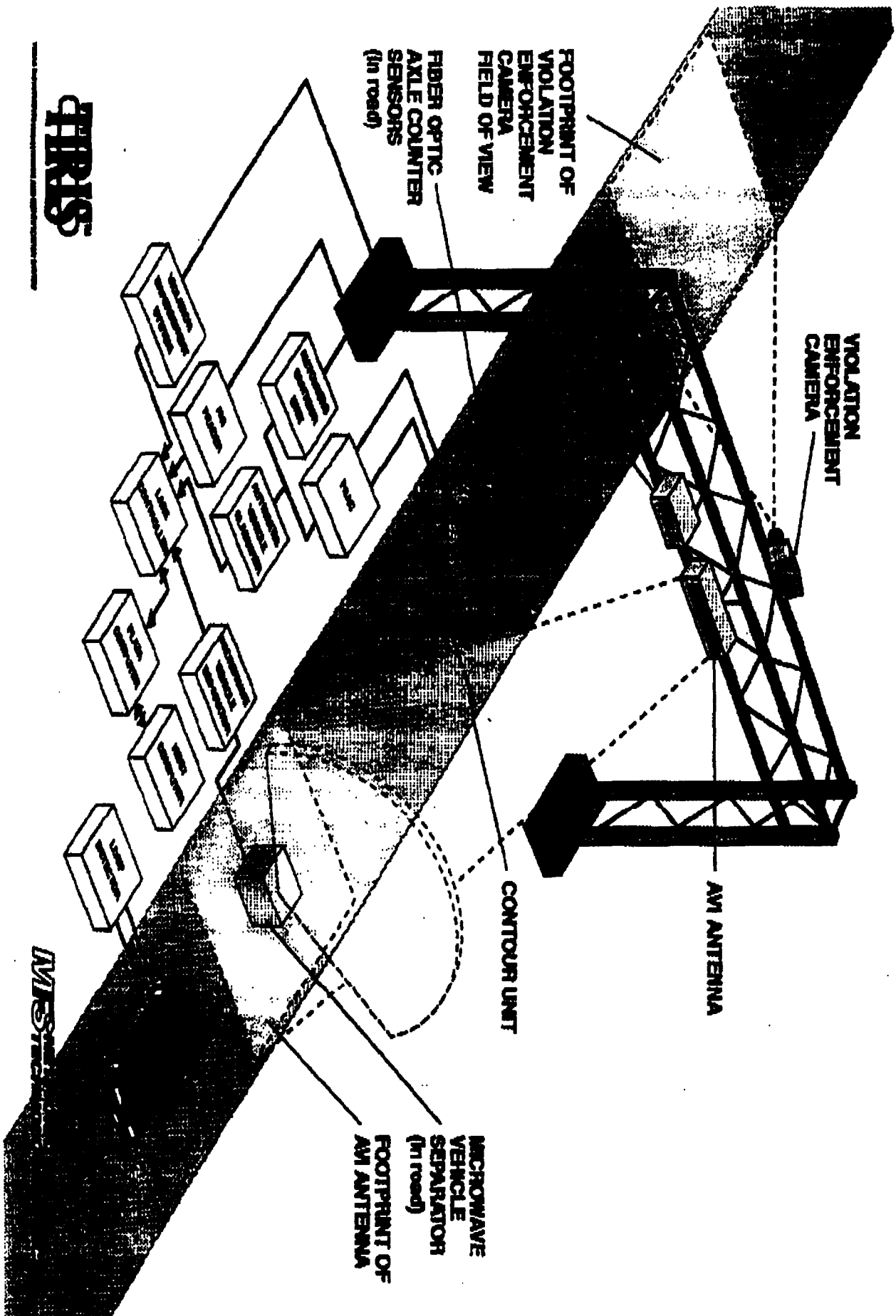
<b>Physical Dimensions</b>	<b>TBD</b>
<b>Weight</b>	<b>TBD</b>
<b>Housing (if applicable)</b>	<b>19-inch rack-mount, or NEMA standard ICS 6-110.12 type 3 dust and rain tight.</b>
<b>Input Power</b>	<b>115 VAC</b>
<b>Output Power</b>	<b>+15 Volts DC <math>\pm</math>0.5 Volts, 5 Amps. -15 Volts DC <math>\pm</math>0.5 Volts, 2 Amps.</b>
<b>Antenna Assembly Interface</b>	<b>High speed serial connection; Transmitting at 600 Kbps Receiving at 300 Kbps on two channels</b>
<b>Lane Controller Interface</b>	<b>RS-422A operating at 38,400 baud</b>
<b>Monitor Port Interface</b>	<b>RS-232C operating at 19,200 baud</b>
<b>Reliability</b>	<b>MTBF: 8000 hrs. MTTR: 0.5 hrs. (Excluding access to unit)</b>
<b>Operating Temperature</b>	<b>0° to 70° C without heater -40° to 70° C with heater</b>



### **TIRIS T915 AVI TRANSPONDER**

- ◆ **FULLY COMPLIANT WITH CALTRANS SPECIFICATION**
- ◆ **READ WRITE CAPABILITY**  
**— FOUR FILES, SIXTEEN BYTES EACH**
- ◆ **OPERATES AT 915  $\pm$  13 MHz**
- ◆ **MODULATED BACKSCATTER**
- ◆ **UPWARD MIGRATABLE**
- ◆ **EIGHT YEAR BATTERY LIFE**
- ◆ **SUPPORTS LAND DISCRIMINATION**
- ◆ **ENCRYPTION**
- ◆ **ERROR DETECTION CODE — CRC-16**
- ◆ **ORIENTATION INSENSITIVE**

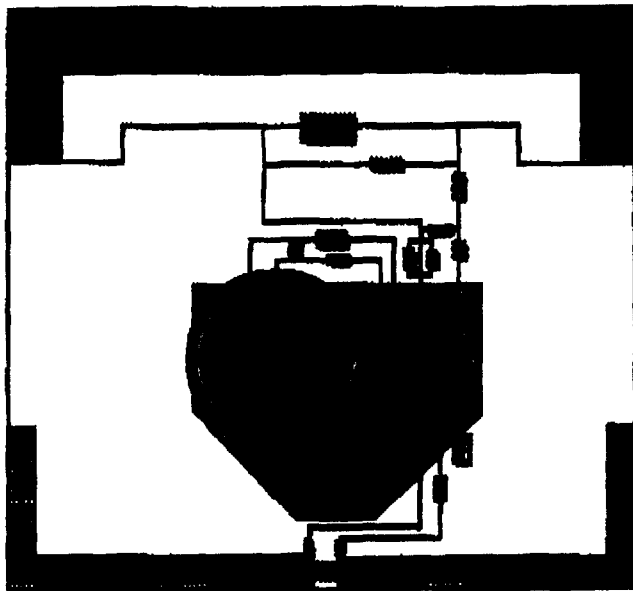
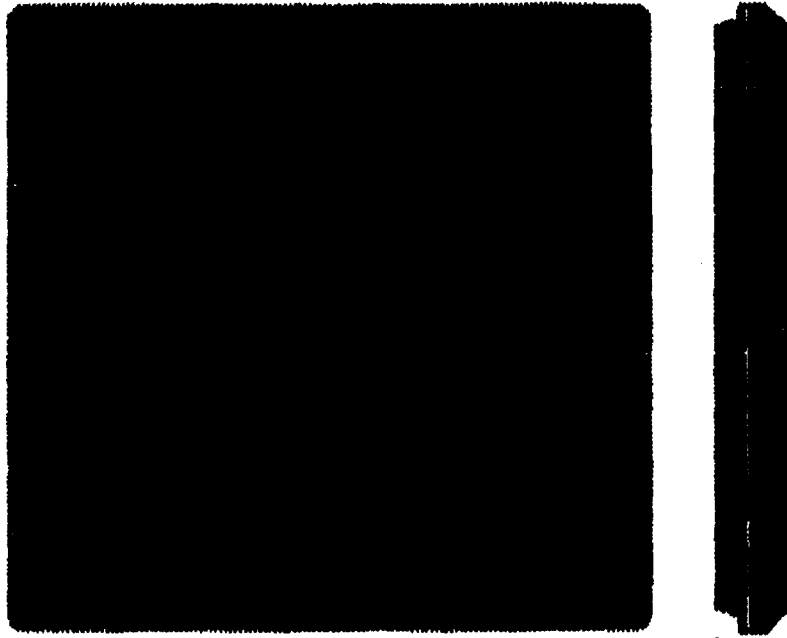
**TIRIS**



**TRIS**

**MISSISSAUGA**

## Outside Case and PC Board





As usual, crowds at the TRB meeting stretched the capacity of the three conference hotels, and many IVHS sessions were packed. Next year's meeting should pose an even greater logistical problem for the TRB, since the Washington Hilton won't be available, and all activities will have to be squeezed into the Washington Sheraton and the Omni Shoreham. Because fewer meeting rooms will be available, the length of the conference will be extended, running from Sunday afternoon through Friday afternoon. Under current plans, each TRB committee will be restricted to sponsoring two sessions next year.

That restriction struck many at a meeting of the TRB's IVHS committee, held during the annual meeting, as unjust and illogical. Growing interest in IVHS is responsible for much of the increased attendance at the annual meeting, said one delegate. "We shouldn't cut out the new kid on the block," he said.

## MFS Wins Contract To Install Toll System On California Bridges

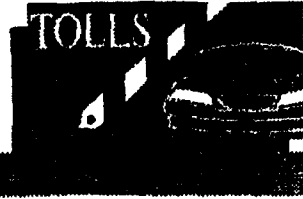
MFS to replace toll collection systems on nine California bridges and implement ETC. System will read HELP tags as well as TIRIS tags. Plans call for system to begin operating for tests only, in fall of this year.

MFS Network Technologies now has a second contract to supply an electronic toll collection (ETC) system in California. The Omaha, Neb. firm beat out Amtech Corp. and Lockheed Information Management Systems (IMS) for the chance to install a new, integrated toll collection system on nine bridges operated by the California Department of Transportation (Cal-

trans). Like the system it's installing on the privately-owned State Route 91 overbuild in southern California, this one will employ automatic vehicle identification (AVI) technology that MFS developed in a joint venture with Texas Instruments' TIRIS division in Attleboro, Mass. (see *Inside IVHS*, Feb. 1, 1993).

The contract for the Advanced Toll Collection and Accounting System (ATCAS) on the nine bridges is worth an estimated \$30 million, says an announcement released by MFS. According to documents Caltrans made available to the public after the contract was announced, MFS' proposal listed a to-

## ELECTRONIC TOLLS



## Surface Systems Inc. (SSI)\* North American Road/Runway Weather Information Systems (RWIS) Network

**SURFACE SYSTEMS INC.** provides

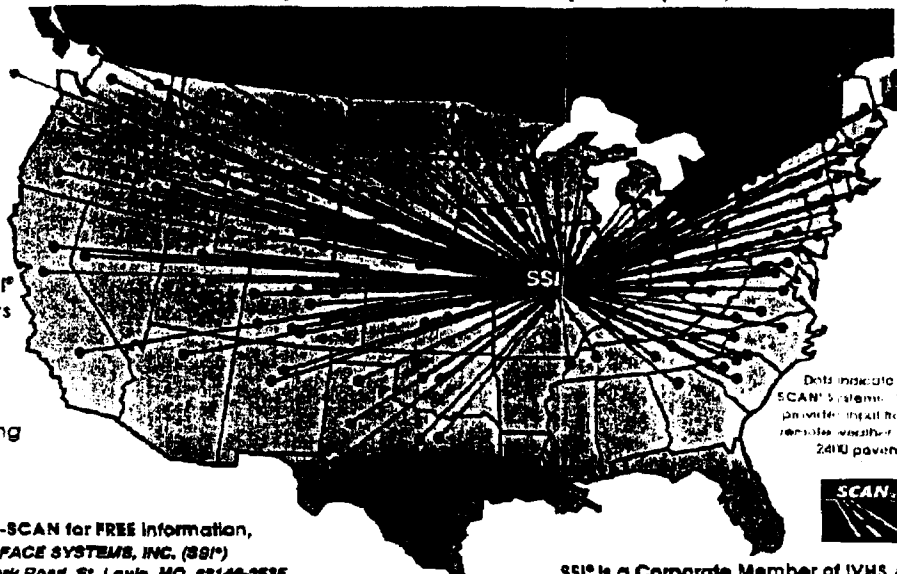
Weather Information Systems and Software

24-Hour Toll-Free Support by SSI\* Meteorologists

Real-Time Pavement Forecasts

System Training and Weather Instruction

Call 1-800-325-SCAN for FREE information, or write to **SURFACE SYSTEMS, INC. (SSI)\*** 11612 Lilburn Park Road, St. Louis, MO 63146-3536



Dots indicate locations of SCAN\* Systems. These systems provide input to the SSI\* RWIS network. Weather data is collected from 2400 pavement sensors.



SSI\* is a Corporate Member of IVHS AMERICA

tal system cost of approximately \$38.7 million. Lockheed's proposed cost was approximately \$40 million, and Amtech's was approximately \$41.1 million, according to the same set of documents.

"MFS will be providing a complete replacement to the existing toll collection system"—virtually every-

*"We will provide a system that reads either."*

thing but the toll booths themselves, says Howard Sierer, vice president of business development at MFS Network Technologies. The AVI system is the TIRIS 915 (named for the radio frequency at which it operates)—a system developed to meet the standards Caltrans has set for non-stop ETC throughout the state. TIRIS stands for Texas Instruments Registration and Identification System.

MFS received the contract because it scored higher than its competitors in a two-part evaluation, says Sompol Chatursripitak, project manager for the electronic toll collection (ETC) system at Caltrans in Sacramento. Proposals were first evaluated on their technical merits; then, cost proposals were unsealed and scored. The technical and cost evaluations each accounted for 50 percent of a proposal's score.

Dallas-based Amtech proposed its Intellitag 2000 system, which was designed in response to Caltrans' ETC standard (see *Inside IVHS*, Sept. 13, 1993). Lockheed, based in Teaneck, N.J., proposed technology from Mark IV IVHS. Mark IV is not known to have developed a system that complies with the Caltrans spec, but Lockheed proposed that Mark IV would produce one "if and when we were awarded the contract," Chatursripitak says.

AVI technology from Mark IV will, however, have a role to play on the Caltrans bridges. The ATCAS contract

requires that the ETC system must be able to read the transponders that have been installed on commercial vehicles as part of the HELP program. These tags are manufactured by Mark IV. HELP uses AVI to allow pre-cleared trucks to bypass state weigh stations and ports of entry.

Since the HELP tags are installed on the trucks' front bumpers, rather than on their windshields, MFS will have to install a second set of antennas in order to read them. "But we will provide a system that reads either," Sierer says. Like any other patron, a trucking company would have to open an account with Caltrans in order to use the HELP tag to pay tolls on the bridges.

Sierer won't say what steps MFS must take to allow its system to read tags from more than one manufacturer, or whether his company would have to negotiate an agreement with Mark IV. "We have several ways of doing that. We have not worked those out yet," he says.

"We would prefer to have cooperation from Mark IV, since they are the leader in the HELP technology," says Chatursripitak. "MFS has been in contact with them. We will continue to work with the two suppliers to make sure we make the system work."

Sierer points out that only a few thousand trucks currently use the HELP tags—a small fraction of the hundreds of thousands of TIRIS tags MFS hopes to sell to Caltrans for distribution to toll patrons. "But in any case, that was part of their request, and we will provide a system."

An "initial version" of TIRIS 915 currently is undergoing factory tests, and MFS has demonstrated it to Caltrans, Sierer says. This fall, MFS is scheduled to have a demonstration system operating on four of the 20 toll lanes on the San Francisco-Oakland Bay Bridge.

During that test, only state-owned vehicles will use the ETC system, says Lisa Murphy, a public affairs officer at

Caltrans. The test will last 60 days. For the system to pass, it must operate for 30 consecutive days during that time without any problems, she says.

Assuming all goes well this fall, MFS will then install a complete system on the Carquinez Bridge, also in the San Francisco Bay area. "That installation should be completed by March of '95," Murphy says. When the Carquinez system has been operating for three or four months, MFS will complete installation on the Bay Bridge, and also install systems on the Antioch, Martinez-Benicia and Richmond-San

*"MFS will be providing a complete replacement to the existing toll collection system."*

Rafael Bridges. Plans call for that phase of the installation to end in October, 1995.

In a third phase, MFS will install systems on the San Mateo and Dumbarton Bridges, and on two facilities in Southern California—Vincent-St. Thomas and San Diego-Coronado. A motorist who opens an account with Caltrans will be able to use the same transponder to pay tolls on all nine bridges.

Since they use the same technology, the AVI systems on the bridges and on the SR-91 toll road will be interoperable. When the SR-91 overbuild is complete, if a motorist with a Caltrans bridge tag enters that road, the AVI system there will read the tag. In fact, the intent of the Caltrans ETC standard is to make all ETC facilities within the state interoperable, no matter who supplies the technology. While California toll patrons won't have to install multiple tags on their cars, however, there's no guarantee they won't have to open more than one account if they frequent toll facilities operated by more than one authority.

ETC vendor AT/Comm, which disagrees with the approach behind the Caltrans spec, is using the bridge contract award as an occasion to criticize the idea of centralized accounting. AT/Comm's system maintains the customer's account on the transponder itself, rather than in a central computer.

MFS' winning bid works out to more than \$425,000 per lane, says AT/Comm in a statement published this month. John Rourke, vice president of sales and marketing at the Marblehead, Mass. firm, contrasts this with the approximately \$1.5 million (or about \$58,000 per lane) his company charged to install its ETC system on 26 lanes of the Illinois Tollway (see *Inside IVHS*, Nov. 22, 1993). It should be noted, however, that AT/Comm's price reflects its work as a subcontractor installing only an ETC system for Illinois, not a prime contractor replacing an entire toll collection system.

## SAIC "Right On Track" For End of Year Finish To Orlando Toll Project

**Final factory demonstration of integrated toll collection system slated for end of this month. OOCEA set to start collecting tolls electronically in May. SAIC abandons ultrasonic vehicle separation system for more costly light curtain.**

Having survived some major setbacks, officials at the Orlando-Orange County Expressway Authority (OOCEA) now say they're on schedule to finish implementing their integrated toll collection system by the end of this year. Science Applications International Corp. (SAIC) is installing the system, which includes electronic toll collection (ETC) equipment from Mark IV IVHS in Mississauga, Ont.

"We haven't changed our schedule one bit from the last one we did," says Harold Worrall, the OOCEA's executive director. SAIC's original \$8.8 million contract called for it to finish the job by July of last year. That date was later moved to September of 1993, but in late 1992 it became clear that SAIC needed a major extension. The two parties re-negotiated the contract and established a new schedule, with several intermediate deadlines and performance goals (see *Inside IVHS*, Feb. 15, 1993).

"Without exception, every milestone has been achieved on or ahead of schedule. We're right on track," says Ed Davidson, director of programs for SAIC's transportation division in San Diego.

SAIC installed an intermediate version of its system, without electronic tolls, in time to open the OOCEA's new GreenWay Southern Connector last July. It has also installed

## DEPARTMENT OF TRANSPORTATION TECHNICAL SERVICES DIVISION

The Minnesota Department of Transportation is requesting proposals for providing support services for the Minnesota Guidestar Intelligent Vehicle Highway systems (IVHS) Program. It is anticipated that multiple Master contracts will be awarded. The contracts are expected to begin on or after February 14, 1994 and continue for three (3) years.

To obtain a copy of the Request for Proposal, request in writing or in person from  
Mr. Don Olson  
Minnesota Department of Administration  
112 Administration Building  
50 Sherburne Avenue  
St. Paul, Minnesota 55155  
Phone (612) 296-3771 • Fax (612) 297-3996

Request for Proposal will be available through the due date. All proposals must be received at the above address no later than 3:00 pm, February 14, 1994 (due date).

This request does not obligate the state of Minnesota Department of Transportation to complete the work contemplated in this notice, and the department reserves the right to cancel this solicitation. All expenses incurred in responding to this notice shall be borne by the responder.